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The Role of Information Processing in Vaccine Acceptance: A Study of Malaysian Facebook Comments on COVID-19 Boosters

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ABSTRACT

Vaccines are biological preparations that provide immunity to specific infectious diseases, playing a crucial role in public health by preventing the spread of illnesses. Given the rapid, widespread transmission of the COVID-19 pandemic, it is imperative to employ an effective vaccination strategy. In early 2021, the Malaysian government launched the National COVID-19 Immunisation Program (NIP) to combat the coronavirus. By mid-2021, the government began promoting heterologous vaccines, urging recipients to take booster shots of a different brand from their initial doses. This study investigates whether the perceptions of Malaysians on COVID-19 vaccination, as expressed on Facebook by the end of 2021, align with the findings of previous studies. Using qualitative content analysis, user-generated comments were collected and analysed from the top three most popular Malaysian online news media, Malaysiakini, The Star, and New Straits Times (NST), during October and November 2021. The study reveals that most Malaysians were reluctant to receive heterologous vaccines as booster shots due to concerns over safety, efficacy, side effects, and long-term impacts. Additionally, political stances influenced distrust in the healthcare system and fostered conspiracy theories regarding heterologous vaccines. The theoretical implication of this study highlights that information processing significantly affects vaccine acceptance. Clinically, the study contributes to policymaking in vaccine programs and the design of effective awareness campaigns to encourage vaccine uptake.

Keywords: *Facebook, Perception, Covid-19, vaccination*

INTRODUCTION

At the end of 2019, the World Health Organization (WHO) Country Office in China reported "viral pneumonia" cases in Wuhan City, Hubei Province. By November 3, 2021, the Straits Times noted that the coronavirus had infected over 200 million individuals across at least 150 countries, leading to widespread fear of infection. Vaccination is recognised as one of the most effective public health initiatives and is vital for preventing infectious diseases (Rana et al., 2021). However, public acceptance of vaccines remains inadequate. In 2019, the WHO (2019) identified vaccine hesitancy as one of the top ten threats to global health, with research indicating that about half of Americans were unwilling to receive the COVID-19 vaccination, primarily due to safety concerns (Neergaard & Fingerhut, 2020).

The rise of interactive social media has heightened interest in public health promotion, as individuals increasingly rely on the Internet and social-generated content for health information. Social media platforms allow lay users and healthcare experts to share opinions on health issues, regardless of their medical accuracy (Ortiz et al., 2019). This environment fosters a diverse array of views on vaccination. Some users advocate for vaccination by highlighting its benefits, while others exaggerate potential side effects or maintain a neutral stance. User perception and understanding can be influenced

by emotions and the nature of the discussion (Jennings & Russell, 2019). Comments range from civil discourse to those containing bias and anger, contributing to the spread of misinformation through compelling narratives and visuals. Vulnerable groups, such as individuals with cognitive disabilities, the elderly, and those with limited literacy or media literacy, are particularly susceptible to these persuasive narratives (Callender, 2016).

As social media's presence expands globally, concerns about the impact of anti-vaccination content on vaccine rejection have also grown (Puri et al., 2020). Misinformation regarding vaccine efficacy, side effects, and drug components can hinder public perception and acceptance, presenting challenges to universal vaccination efforts (Tustin et al., 2018). This poses a significant threat to the acceptance of new vaccines, including ongoing research for effective COVID-19 vaccines.

This research aims to identify Facebook comments reflecting significant vaccine hesitancy and exaggeration regarding vaccine efficacy, thereby effectively targeting Malaysians' perceptions of the COVID-19 vaccine. By doing so, relevant authorities can provide accurate information addressing these hesitations. Governments, public health experts, and policymakers must understand public perceptions and attitudes toward vaccines to design effective awareness campaigns that promote vaccine acceptance (Rana et al., 2021). In mid-2021, the Malaysian government granted conditional authorisation for the Pfizer-BioNTech COVID-19 vaccine as a booster dose for high-risk populations, encouraging recipients to receive a booster shot for optimal protection. This context raises questions about whether Malaysians' perceptions of COVID-19 vaccination on Facebook align with results from previous studies after a year. These two research questions chosen to fulfil the research objectives were:

RQ1: What were Malaysians' perceptions of COVID-19 boosters on Facebook?

RQ2: What were the attitudes of Facebook users in Malaysia toward COVID-19 boosters?

Social Judgement Theory

Information processing significantly affects individuals' attitudes and acceptance of information, often influenced by pre-existing beliefs and norms (Scannell et al., 2021). Social Judgment Theory (SJT) posits that the impact of persuasive communication on a specific topic hinge on how the recipient perceives the message (Sherif & Sherif, 1967). According to SJT, individuals possess three latitudes for processing information regarding any topic: latitude of acceptance, latitude of rejection, and latitude of non-commitment (Smith et al., 2006). However, sensitive issues such as vaccinations, which have become politically charged, often exhibit a smaller latitude for acceptance, making persuasion more challenging (Scannell et al., 2021).

While SJT is primarily a persuasion theory used to predict belief change, it is a guiding framework used in this study to explore perceptions and attitudes. This research focuses on individuals' pre-existing attitudes, emphasising the dimension of discrepancy to investigate Malaysian perceptions regarding heterologous COVID-19 vaccines. Discrepancy refers to the gap between the advocated stance of a message and the receiver's stance on the issue (O'Keefe, 2016). According to SJT, the acceptance of a message depends on the receiver's perception of the issue (Sherif & Sherif, 1967). O'Keefe (2016) suggests that a highly discrepant message can lead to an attitude change, provided it does not exceed the receiver's latitude of rejection. In summary, messages that conflict with the receiver's stance will likely provoke a negative attitude toward the issue.

Vaccine Hesitancy

In 2019, the WHO mentioned vaccine hesitancy among the top ten global health threats. Vaccine hesitancy is defined as "despite the availability of vaccination services, there is a delay in receiving or refusing vaccination. Factors such as complacency, accessibility, and assurance impact the vaccine." (MacDonald, 2015, p.4163). The public acceptance of the vaccine is the key to achieving an effective COVID-19 vaccine for infectious disease prevention (Rana et al., 2021). Research in Jordan found that the challenge to reaching "herd immunity" in Jordan was people's perception that a "more natural" way to fight COVID-19 infection is safer and has no side effects (Rana et al., 2021). This perception should be changed if the Jordanian government wishes mandatory COVID-19 vaccination. Dubé et al. (2014) found that vaccine acceptance depends on the public's perceived significance of vaccines.

On the other hand, the significant factors influencing vaccine hesitancy include social interaction, media reports, and risk perception toward vaccines. In the United States, a rising number of parents have been influenced by unverified reports that link measles vaccination to autism spectrum disorder and decided not to vaccinate their children (Jennings & Russell, 2019). These statements were also partly supported by celebrities and influencers with millions of Facebook fans (Jennings & Russell, 2019). Many individuals regard signs of celebrity endorsement, like comments and ranking of popular articles, as "genuine" indicators of credibility. However, in Malaysia, vaccine hesitancy arises from a combination of cultural, religious, and social influences, including hearsay and anti-vaccination propaganda spread through social media and word of mouth, which foster negative perceptions about vaccines, compounded by factors such as adverse immunisation experiences, pseudoscientific beliefs, and reliance on traditional medicine (Wong et al., 2020).

Roles of Facebook during the Pandemic

The rise of the Internet and social networking sites (SNSs) has transformed social discourse into a dynamic online public sphere. Within this sphere, two types of interaction occur: between users and media organisations and among users themselves (Dahlgren, 2005). Unlike traditional media, which typically offers a one-way flow of information, SNSs enable many-to-many interactions, breaking down physical barriers.

As platforms like Facebook and Twitter gain popularity, their infrastructure facilitates communication, allowing algorithmic filtering to influence user perceptions and behaviour (Stewart & Hartmann, 2020). Facebook has become a key platform for consuming, producing, and distributing content, especially during the COVID-19 pandemic. It is a significant source of political and health information and has proven to be an effective medium for disseminating information rapidly during emergencies (Malik et al., 2021). However, it also facilitates the spread of accurate and misleading information about COVID-19, raising concerns about information credibility (Malik et al., 2021).

Despite these challenges, Facebook has become a prominent space for news consumption, with online media surpassing traditional outlets in Malaysia since 2017 (Oeldorf-Hirsch & DeVoss, 2019). However, the mixed nature of information on Facebook can create confusion about credibility, as it can stem from various sources—original media outlets or friends sharing posts (Oeldorf-Hirsch & DeVoss, 2019). Past outbreaks, such as Ebola and Zika, have led to infodemics on Facebook, a trend that persists with vaccine discussions (Yang et al., 2021). It plays a crucial role in shaping users' perceptions of health issues and can mobilise collective actions, including protests against vaccination (Smith & Graham, 2019).

Influential of Facebook Comments on Vaccine Perceptions

Facebook has become a significant platform for spreading accurate and false information, including vaccine-related claims (Smith & Graham, 2019). Dubé et al. (2014) found that such claims contribute to vaccine hesitancy among social media users. The platform's comment system allows users to share ideas, which can alter perceptions of public opinion on vaccination (Kim et al., 2020a). Li & Sundar (2021) suggest strong bandwagon cues can reduce reactance and improve persuasion by eliciting bandwagon perceptions. Comment action is also linked to a sense of agency, positively predicting the intention to follow the message recommendation (Li & Sundar, 2021). Conversely, some studies argue that comments have a limited impact on users' perceptions (Jennings & Russell, 2019; Dixon, 2020; Kim et al., 2020a; Kim et al., 2021b). Research on infodemics indicates the overwhelming information on social media does not easily sway individuals, as they seek reliable sources. The influence of comments depends on users' beliefs about vaccine efficacy, with those perceiving vaccines as effective being less affected by less informative comments (Kim et al., 2020a). The civility and credibility of comments also play a role, as exposure to anti-vaccine comments may lower pro-vaccine users' confidence in the journalists and organisations publishing them (Dixon, 2020). These findings suggest that social media comments do not easily sway vaccine perceptions, especially on public health issues.

METHOD

This study employed qualitative content analysis to interpret Facebook comments on articles about Malaysia's COVID-19 booster shots published by Malaysiakini, The Star, and the New Straits Times (NST) between October and November 2021. These platforms were selected based on their widespread popularity among Malaysian Facebook users, with data supported by Media Pod (2022) and Malaysiakini (2018) and further validated through their official Facebook pages. Malaysiakini leads with approximately 1.8 million followers, The Star with 1.3 million, and NST with 0.93 million followers. Their significant audience reaches an active engagement rate, affirming their status as Malaysia's top three digital news portals. Malaysiakini, in particular, has been recognised for its credibility and audience trust, as noted in the Reuters Digital News Report (Malaysiakini, 2018). The selection of these platforms ensured a representative sample of public discourse, enabling a robust analysis of public perceptions and attitudes toward COVID-19 booster shots. The cross-checking process on their official Facebook pages confirmed their ranking and highlighted their roles as dominant channels for disseminating information and shaping public discussions in Malaysia. Facebook was chosen as the platform for data collection due to its widespread use (91.7% of Malaysians have a Facebook account) and the free access it provides to news and discussions (Zainul et al., 2021).

Data collection occurred between October 1 and November 30, 2021, when Malaysia's Health Ministry launched a booster campaign for Pfizer, Sinovac, and AstraZeneca vaccines. The purposive sampling method selected keywords like "COVID-19," "vaccine," "booster," "mix vaccine," and specific vaccine names to ensure the data collected was directly relevant to the research focus on vaccination discourse. These keywords were chosen based on their high association with public discussions about vaccination programs, booster shots, and mixed vaccine strategies. The keywords reflect the language and terminology commonly used in official announcements, media coverage, and public discussions about vaccination campaigns. This ensured the collected comments represented the public's real-time responses to vaccine-related issues. Filtering comments with the "most relevant" button and selecting those with five or more words ensured that the analysed content was meaningful and provided substantive insights into public opinions and attitudes. A total 340 comments were

collected, with irrelevant or repetitive ones filtered out.

Themes from previous studies (Zainul et al., 2021; Scannell et al., 2021) were adopted as a foundation for the coding framework, focusing on commonly discussed topics and attitudes toward COVID-19 vaccines. During the analysis, new themes emerging from the collected data were inductively added to reflect unique patterns or discussions not covered in previous research. This adaptive approach ensured the framework remained relevant and comprehensive, capturing the full spectrum of public discourse surrounding vaccines.

Table 1: Coding list for data analysis

Themes	Description	Quotations
Safety and efficacy	The effectiveness and protection of vaccines, including the side effects after vaccination	*I'm a highly allergic individual and suffered side effects from my 1st and 2nd dose of Sinovac. Permanent effect can't eat bread and many other foods suddenly after 2nd dose, full body swelling and rash.* *If Pfizer-BioNTech is so effective against Omicron, why is those in US or Britain the number of people affected comes to ten of thousands or more than a hundred thousand, whereas those in Indonesia and Thailand who rely more on Sinovac has minimal cases.*
Scepticism	Comments that contained conspiracy theory and unproven claims	*Still insist on mixing. Wasting precious time in combating the pandemic just because they want to finish off the overstock of Pfizer. This is disastrous.*
Politics	Comments that criticised public policies that related to the vaccination process	*This is ridiculous! How can you force this with the booster!* *If you cannot control the Omicron variant and is increasing you are forcing the people to get booster jab, and increase the fine and jail term. You think in this way you can control the number. Stop dreaming, the public need to know is just a button away.* *Don't force it on the people. Also, don't decide for them and push people brands that they don't want. We've all been practically forced to take 2 doses already. We're not your lab rats for you to force repeated doses of experimental drugs. It's forced consent.*
Sarcasm	Comments that used satirical and sarcasm words when referring to the mix COVID-19 vaccines.	*You okay ah? I am your lab rat is it?* *Kit-kat dipped together with Nutella will turned into SUPER Kit Kat, flavor booster, more chocolatey!*

		This is a way of introducing opium to world population legitimately. Be aware.
Anecdotal	Comments that elaborate self-experiences or stories without evidence.	*Done and it's mix previous one are Sinovac both doses and Pfizer for booster. So far so good.* *I took Prifzer as my booster shot after two doses of Sinovac. Nothing gone wrong here. I'm still feel healthy as before.*
Information	Comments that supported by evidence-based information or reliable sources.	*The immune system is not meant to be permanently boosted. The memory T cells will remain in the bone marrow to fight the next infection.* *Yesterday kini tv just showed video of WHO Chief Scientist who said booster shots not encouraged and is worried about dangerous trends of mixing vaccines for booster shots.*
Participation	Comments that stated choices whether participate in the vaccine program or not participate.	*If you do not want to have the 3rd booster shot which is now Pfizer, please just keep your choice to yourself.* *If the government schedule my booster shot using pfizer* *I will definitely NOT GO but if scheduled using sinovac I will 100 percent GO.*
Attitudes		
Anti-mix vaccine	Comments discouraging acceptance of the COVID-19 vaccine	*Since I didn't have any side effects after my 2 shots of Pfizer I will only take Pfizer booster. Don't want to mix.* *If no Sinovac booster l will not take Pfizer booster don't play with our life.*
Neutral	Comments that do not bias to any type of vaccines	*No vaccines will last forever in terms of an antibody response. As for me I don't mind the Sinovac vaccine. It is based on the traditional method that is proven safe. Besides, look at China they are all open and not in lockdown anymore since last year and the rest of the world is still in lockdown. So if that is not actual prove that Sinovac works then I am not sure what else.* *Even Pfizer, AZ and the rest are prepping boosters, as they are still studying how long immunity could last... for now, the estimate for Pfizer is 8-12 months and it defers according to each individual's immune system and antibody buildup.*

Support mixed vaccine	Comments that encourage COVID-19 vaccine uptake	*Take whatever is given, it is protection against serious illness and death from covid. All vaccines eventually require booster shots. And they should get better over time. Don't overthink or be choosy!* *Done and it's mix previous one are Sinovac both doses and Pfizer for booster. So far so good Suggest before going to get the booster consult to own family doctor first.*

Ethical Considerations

The use of social media for data collection introduces unique ethical challenges. Unlike traditional studies, where participants are directly approached for informed consent (Hammer, 2017), this study relied on publicly available Facebook comments. While this bypassed direct consent procedures, the comments were voluntarily posted in public forums, implying user awareness of their visibility. Hammer (2017) argued that researchers may assume implied consent in such cases. Nevertheless, all analysed data were anonymised to respect user privacy and avoid misrepresentation. These ethical measures ensured that the study adhered to principles of fairness and integrity while leveraging the rich data available on social media platforms.

FINDINGS

Ten themes emerged from the data from this online community to answer research questions. The themes included the safety and efficacy of vaccinations, scepticism, anecdotal information, participation, humour and sarcasm, politics, support of mixed vaccines, anti-mix vaccines, and neutrality on mixed vaccines. The first seven themes were organised to answer RQ1, while the last three responded to RQ2.

Safety and efficacy of vaccinations

The first theme from the collected data was the perspective of the online community that most concerned them: the safety and efficacy of vaccinations. Five subthemes emerged from this theme: safety, side effects, long-term effects, and effectiveness of the vaccine. The themes of the comments addressed the potential health effects of receiving mixed vaccines and the adverse effects of vaccination.

The first subtheme from the central theme was safety. The comments claimed that the well-being of vaccine recipients after receiving mixed vaccines, especially among elders, was a concern. Most of such comments included stating that there was no evidence showing that heterologous vaccines are safe, and no one can guarantee no harm to recipients' health. Concerns about the safety of vaccinations were reflected in their comments:

> *Yesterday kini tv just showed video of WHO Chief Scientist who said booster shots not encouraged and is worried about dangerous trends of mixing vaccines for booster shots. (Aleem, NST)*

Besides safety, side effects after vaccinations were the subtheme of safety and efficacy. The most frequent comments in this subtheme concerned the side effects after receiving mixed vaccines

and any side effects they experienced. The side effect was reflected in several comments as the main reason for persisting with the same vaccine as their third shot.

> *Now US FDA ASK to stop giving pfizer booster shot for age 16 to 65 above due side effects. With all the different information I would rather stick to my sinovax which had proven the least side effects. (MengAi, The Star)*

Furthermore, the long-term effect was also part of this theme. Based on the comments stated the government has not considered long-term effects. Since the government did not conduct proper research and urged people to take the mixed vaccines, online communities complained about it.

> *[…] You have totally no concern about long term side effects? What you don't see immediately does not mean it will not have a detrimental outcome years later. (Jae, NST)*

> *Why must mix the vaccine? Nobody knows the long term effect (Miza, The Star)*

Moreover, the effectiveness of vaccines was also a perspective concerning the community. Most of the comments were quotes from experts and the WHO, which did not recommend mixed vaccines since their effectiveness was insignificant compared to the same vaccine.

> *Proven in Chile, Turkey and other studies. (Effectiveness of 80% compared with 90%). Why is MOH not giving Sinovac 3rd Dose Option?? More so now with the higher infectivity rate […] (Ricardo, The Star)*

Scepticism

The second theme from the data is scepticism. The online community was sceptical about heterologous vaccines. This theme has two subthemes: conspiracy theories and questioning. The online communities showed scepticism by raising questions and believing in conspiracy theories rather than the health minister.

The conspiracy theory was a subtheme of scepticism. This subtheme included comments claiming that the mixing of vaccines was motivated solely by profit; the health minister received money from pharmaceutical companies to force people to jab mixed vaccines, and those vaccines were almost expiring.

Seems to me like vaccines getting old and near expiry? So need to administer soonest instead of throwing it away.? (Steven, NST)

Every few months for the rest of our lives - if we can survive the jabs just to fill the pockets of the big pharma and ruthless politicians (Theresa, Malaysiakini)

Another subtheme of the scepticism theme was questioning. The online community raised many questions because it was sceptical about mixed vaccines. The most common question asked by the community was about the efficacy of mixed vaccines.

> *Are there scientific reports to show Pfizer booster shot is better? Why recommend mix booster vaccines. […] Is the mix and match prevent future results of determining the causation of human health and physiology deterioration??? (Yeoh Ksoo, Malaysakini)*

Anecdotal

The third theme is anecdotal. Anecdotal is content that tells a story that is not based on evidence. The subthemes from this theme were self-experience and story.

Self-experience is defined as a personal story that occurred to the commenters themselves. Most of the claims made that they had no significant side effects after receiving the third dose or booster dose, which differ from the first and second dose.

> *I had two doses Sinovac, was called for booster last week rather hesitant but I went there were doctors at Summed for counselling. Spoke to the doctor and I decided I will go on Pfizer so I had a third dose. I experienced no fever. No headache, second day a little soreness on the arm that was vaccinated and it's five days I am ok. So did my few neighbours all are fine and normal. (Osman, NST)*

Besides self-experience, the story was also part of the theme. The contents included other people's experiences, which were not experienced by the commenters themselves. This subtheme was like the previous "self-experience" subtheme, expressing that their friends and families who took booster doses of different brands from the first two doses experienced the least side effects.

> *Two of my elderly aunties 66 and 72 took their first two doses of Sinovac and booster shot of Pfizer recently. Praise God both are really fine with little side effect and getting on with life as usual. (Rina, NST)*

Information

Nevertheless, the next theme is evidence-based health information. This theme derived three subthemes: health information, WHO guidelines, and links. Health information was the first subtheme of the "information" theme. The most relevant content was basic knowledge about the immune system.

> *Guys please know the science. Antibodies will tail off in about 6 to 8 months after the 2nd dose. The T-cells and the memory cells will remain for life to assist in your immune system. (Michael, NST)*

Moreover, the World Health Organization's (WHO's) guidelines were also one of this category's subthemes. A portion of the online community adhered to WHO's guidelines on vaccines. The claims made that the mix-and-match vaccines approach needs further studies, and it will not encourage it. The abbreviation, WHO was repeated frequently in the comments.

> *As per WHO latest guidelines, they have stated that mix and match Vaccine needs more time to be thoroughly studied before it's can be administered to the general public as those initial studies is not conclusive as yet. (Khong, Malaysiakini)*

The third subtheme under the theme of health information was links or references, which were besides health knowledge and WHO guidelines. The most frequent comments in this subtheme were links to the drug company's website, research articles, and online newspapers to strengthen their viewpoints.

National Institutes of Health increases in COVID-19 are unrelated to levels of vaccination across 68 countries and 2947 counties in the United States https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8481107/ (Yung, Malaysiakini)

Participation

Participation was also one of the themes that emerged from the data set. This theme encourages people to participate in action to prevent becoming sick with diseases or prevent side effects and long-term effects. Two subthemes from this theme were encouraged to participate in the vaccine program and choice for vaccines.

The first subtheme of the participation theme was encouraging participation in the vaccination program. The statement claims that the vaccine program was based on self-voluntary and was provided for free.

My 1st n 2nd was Sinovac, got my Booster jab last Wednesday, next day went to melaka for 2 nights, nothing happened, just normal. Just go for it. (Danny, NST)

Nevertheless, many commenters perceived that the government should not deprive the choice people of the choice to take a booster dose. In addition, the health ministry had promoted mix-and-match vaccines where the people were sceptical about their safety. The commenters' statements claimed that people should have the freedom of vaccine choice, and their preference was to take the same type of vaccine as before. The people's choice of vaccination was reflected in several comments.

Don't take away the Freedom of Choice of Individuals who are already participating in the Societal good. Let them decide if they want to mix or not (Marcus, NST)

Sarcasm

This comment category also prevalently used sarcasm or humour. Its content uses sarcastic and funny words when referring to the third dose of vaccination or booster shot. Commenters used humorous and sarcastic words to vent their frustration with the health ministry's decision to promote mix-and-match vaccinations. The words "stupidity," "zombie," and "depopulate" were used in the comments.

KJ has a breakthrough new limit of his stupidity. Experimental on human body and life through this mix vax inactive and mrna. (Razif, The Star)

They think they are more knowledgeable than the scientists at WHO... (Ung, NST)

Better for your mission, to depopulate world. (Syafa, Malaysiakini)

Politics

Politics was also the prevalent comment category among online communities. This theme focused on political figures, policies, and government. Subthemes of political themes included critics of the vaccination policy and questions about the health minister's competence.

Unlike the previous section, which used humour and sarcasm to vent their frustration with the government, some of the commenters directly critiqued the government, forcing people to have their

third shot with no choice of vaccine brand. People also needed to pay themselves for a booster shot to avoid mixed vaccines. People's voices were reflected in several comments.

> *Downplay the virus, manipulate figures to look like virus is well under control, persuade Agong to end emergency, declare Sarawak election within 60 days, then up-play the virus again, to persuade ppl to get booster, before the election causes disastrous outbreak of Covid. (Lara, The Star)*

Besides being critiqued by the government and the policies, the public also questioned Khairy Jamaluddin, the health minister's ability. Commenters were sceptical of Khairy's health statement as he was a sports minister before becoming a health minister. Khairy's competence was questioned, and he failed to persuade the public because he was not a medical doctor. Several comments questioned his competence.

> *You still trust a sport minister to talk abt [about] health issues? […] (Anand, NST)*

> *Do not mix sinovac with Pfizer kj. You are not a doctor. (Liew, Malaysiakini)*

Support mix vaccine

Some commenters supported mixed vaccines by encouraging others to get their vaccines. The statements claimed that people need to get the vaccines regardless of the vaccine's brand, even though they are not experts. If they reject the mixed vaccine, give it to those who need it.

> *Just go and get yr shot la. Regardless of what brand. Every year you go for flu shots you never even ask which brand you are getting. (Steven, NST)*

Anti-mix vaccine

More people opposed mixed vaccines than those who supported them. The commenters clearly stated that they would reject the third vaccination dose or refuse to take a mixed vaccine.

> *Many people experience side effects, say no to the third dose...!!!!! (Jamil Tdi, NST)*

Neutral

As compared to the bias, there were only a few commenters who took a middle stance. These comments did not bias toward any vaccines and just stated their opinion.

> *If you do not want to have the 3rd booster shot which is now Pfizer, please just keep your choice to yourself. (Toon, NST)*

DISCUSSION

Social media has become a key driver in disseminating anti-vaccine narratives, often amplified by algorithms that prioritise engagement over content accuracy. Facebook's comment sections allow users to share vaccine refusal stories, pseudoscientific claims, and conspiracy theories, creating echo chambers reinforcing preexisting beliefs. Jennings and Russell (2019) observed that the participatory nature of social media, such as commenting and sharing, enables users to influence public opinion, potentially normalising vaccine hesitancy. The findings of this study align with this perspective,

showing how the Facebook pages of major news portals contribute to vaccine discourse, offering spaces for public debate while also presenting challenges in addressing misinformation. For instance, The Star often highlights medical expert opinions, but vaccine sceptics frequently dominate its comment sections, shaping perceptions. In contrast, the NST exhibited higher engagement, reflecting how localised cultural contexts influence vaccine discussions.

In the Malaysian context, online anti-vaccine movements have significantly hindered immunisation efforts, with internet-driven misinformation fuelling hesitancy (Mohd Azizi et al., 2017). The findings of this study align closely with existing research on vaccine refusal movements, particularly those observed on social media platforms like Facebook. The study's identification of three distinct categories of anti-vaxxers—persistent, moderate, and uncertain, echoes earlier research that categorises vaccine refusal behaviours (Wan Mohd Ghazali et al., 2021). These categories provide valuable insights into the varying degrees of resistance to vaccination, focusing on how self-presentation on Facebook shapes individuals' vaccine-related beliefs. As discussed by Jennings & Russell (2019), social media allows individuals to present their views in ways that can significantly influence the attitudes of others, particularly those in the uncertain category who may not have firmly held beliefs about vaccines. However, earlier studies suggested generally positive attitudes toward COVID-19 vaccines. For instance, Elnaem et al. (2021) reported that 97.9% of respondents were confident in vaccine effectiveness, and Mohamed et al. (2021) found that 64.5% were willing to get vaccinated. This study, however, contrasts with those findings, as a substantial number of comments opposed heterologous vaccines, revealing shifting attitudes. According to SJT, when messages conflict with an individual's existing stance, they may reinforce resistance, contributing to more negative views on mixed vaccines (O'Keefe, 2016).

Anti-mix vaccine sentiments in the comments indicated dissatisfaction with vaccine brands' lack of choice. Vaccine hesitancy often represents a flexible decision-making process shaped by perceived risks and uncertainties. Resistance to vaccines frequently arises from viewing mandates as threats to personal freedom (Lazarus et al., 2020). Although mixed vaccine programs have been implemented in various countries, public acceptance remains challenging. Addressing safety concerns through clear communication and transparent policies is critical to enhancing vaccine uptake (Harrison & Wu, 2020).

This study underscores social media's dual role in shaping vaccine attitudes. While it can facilitate knowledge sharing and debate, it also enables the spread of misinformation, intensifying vaccine hesitancy. These findings highlight the need for targeted public health strategies that address misinformation and engage communities in culturally sensitive ways to improve vaccine confidence and acceptance.

Participation

From the findings, most commenters stated they would only participate in the booster program if the same vaccine as the previous doses were provided. The SJT proposed that the acceptance of a message depends on the receiver's perception of an issue (Sherif & Sherif, 1967). Information processing is influenced by the attitudes of individuals and the extent to which they receive information by their beliefs and norms (O'Keefe, 2016).

When commenters perceived that heterologous vaccines contradicted their beliefs, they said they would not receive them. This was to Scannell et al.'s (2021) research, which suggested that there may be a smaller latitude for acceptance in some sensitive topics, such as vaccinations, because this

topic has become politically charged. These findings show that a highly discrepant message in one's beliefs may lead to a change in attitude (O'Keefe, 2016).

Safety Concerns about Vaccines

Concerns about vaccine side effects and long-term impacts were frequently discussed. Many vaccine recipients refused a third dose different from their initial vaccine series, citing stories of long-lasting side effects, temporary serious harm, mild reactions, and even death. Similar safety concerns have been raised for other vaccines, such as those for measles (Jennings & Russell, 2019), HPV (Ortiz et al., 2019), and smallpox (Meleo-Erwin et al., 2017). However, claims about adverse effects were primarily based on anecdotal evidence rather than data from evidence-based medicine.

Vaccine hesitancy was driven mainly by hearsay and anti-vaccination propaganda spread via social media and word of mouth (Wong et al., 2020). Even people who have not personally experienced adverse effects believed the information shared by friends and the media. Research has shown that exposure to anti-vaccine narratives can raise doubts about vaccine safety, even among those who distrust such content (Ward et al., 2017). In contrast, the National Pharmaceutical Regulatory Agency of Malaysia (2022) reported that only 8% of booster doses resulted in serious adverse events, a lower rate than all COVID-19 vaccine doses combined.

Politics and Conspiracy Theories

Politics and conspiracy theories were also prevalent in the comments. Those who believed in conspiracy theories, attributing hidden and sinister motives to events, were less likely to get vaccinated (Jolley & Douglas, 2014). Although fears related to COVID-19 conspiracies existed before the pandemic, they were likely intensified by societal uncertainty (Pertwee et al., 2022). The findings revealed public distrust toward the government and pharmaceutical companies, with accusations of global conspiracies based on unclear premises. Concerns included expiring vaccines and the need for endless boosters, fuelled by mistrust of both entities. This aligns with a study in Jordan, where drug companies were accused of promoting mixed vaccines to boost profits (Junior et al., 2021). Conspiracy theories have been linked to under and delayed vaccination in the U.S., Europe and Jordan (Junior et al., 2021; McIntosh et al., 2016). While misinformation plays a role in vaccine hesitancy, Pertwee et al. (2022) emphasised that focusing solely on information overlooks broader socio-cultural, historical, and political factors.

Trust in the Healthcare System

Studies show a positive link between vaccine uptake and trust in government health systems and healthcare professionals (Larson et al., 2018). In England, those who believe in conspiracy theories are less likely to follow government guidelines and tend to distrust authorities (Freeman et al., 2020). Exposure to conspiracy theories and non-mainstream sources can lead to extremist attitudes and ideological denial, creating echo chambers resistant to evidence-based medicine (Klimiuk et al., 2021). Pertwee et al. (2022) argue that COVID-19 conspiracy theories should not be seen simply as misconceptions but as reflections of widespread public fear and concern.

Distrust in government and institutions involved in vaccine production and distribution has been a significant issue in many countries (Pertwee et al., 2022). Dissatisfaction with the government's handling of the COVID-19 crisis and policies that strained the healthcare system and economy likely contributed to this distrust (Lazarus et al., 2020). Misinformation often thrives where there is a lack of

trust in government and elites (Jennings et al., 2021). Research has shown that vaccine attitudes, confidence in public health authorities, and political views are interconnected (Baumgaertner et al., 2018). Additionally, belief in conspiracy theories is closely linked to distrust of politicians (Larson et al., 2018). Thus, public perceptions of COVID-19 vaccination vary according to different levels of trust in political figures. Building trust is vital for governments and public health bodies to implement healthcare interventions successfully.

Sarcasm

Another notable finding was that users often employed sarcasm and humour to criticise the government indirectly rather than voicing direct discontent. Sarcasm and irony are non-verbal cues that convey meanings opposite to their literal interpretation (Filik et al., 2015). Sarcasm is commonly used to express criticism, aligning with the findings where people expressed dissatisfaction with the government's promotion of heterologous vaccines through sarcastic remarks. Examples include comments like "Better for your mission, to depopulate the world" and "They are more knowledgeable than the scientists at WHO.

Dews, Kaplan, & Winner (1995) suggest that sarcasm helps soften the emotional impact of criticism or praise. Sarcastic criticism, such as "They are more knowledgeable than the scientists," carries a veneer of positive literal meaning (witty and clever), making the critique seem less harsh. This may explain why commenters chose sarcasm over direct criticism to express their opposing views (Filik et al., 2015).

LIMITATIONS AND FUTURE STUDIES

The primary limitation to generalising these findings was that only Facebook comments were analysed. This research is also limited to the English online news media on Facebook, without a more exhaustive analysis of different languages of news media. In addition, the manual evaluation and categorisation of collected data were one of the limitations. This evaluation and categorisation of data are subjective, and some claims were hard to categorise due to no clear boundaries between categories. This research also missed extreme comments, such as offensive and aggressive comments that Facebook or the page administrator may have removed. Future studies can expect to conduct a large-scale content analysis from all online news sites in Malaysia, which is wider than English, to avoid generalising the findings.

Furthermore, the platforms chosen to conduct content analysis can be various, focusing on Facebook, Twitter, YouTube, and Instagram. By analysing comments, authorities can better target misinformation and design effective campaigns (Rana et al., 2021). Public criticism of the government's pandemic response further fuelled hesitancy, underscoring the need to build trust in vaccination programs (Pertwee et al., 2022).

CONCLUSION

Malaysia introduced heterologous booster vaccines in late 2021, which elicited mixed public perceptions and attitudes. This study analysed Facebook comments to explore Malaysians' responses to the COVID-19 vaccination program. Findings revealed that many Malaysians preferred receiving the same vaccine for booster doses, citing safety concerns, while conspiracy theories and political scepticism further fuelled vaccine hesitancy. Some individuals shared positive experiences that helped mitigate doubts, yet scientific misunderstandings about vaccine mixing persisted. These results

highlight the role of social media in shaping public debate and the importance of addressing vaccine hesitancy through targeted health campaigns. To increase vaccine uptake and achieve herd immunity, the health ministry must focus on understanding public concerns, improving communication strategies, and enhancing trust in healthcare services.

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